

(Trends in Canadian Atlantic Mainland Fisheries Past, Present, and Future)

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(INTRODUCTION)

THE HISTORY of our fish landings from the southern part of the Northwest Atlantic Ocean helps us to forecast future trends. To this end, we have examined 45 years of statistics of landings and product values for the Canadian provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Quebec. We sorted these statistics by species groups (groundfish, pelagic fish, estuarial fish, crustaceans, and molluscs) and plotted main species by years in the accompanying figures. The data are presented for the Canadian Atlantic mainland as a whole and by provinces. Newfoundland statistics were excluded because they are not available in comparable detail. Landed weights have all been converted to thousands of metric tons, round fresh weight.

The development of foreign fisheries in the area gives indications of the general direction of, and potential for, future expansion. Accordingly, we examined some of the trends in competing foreign fisheries.

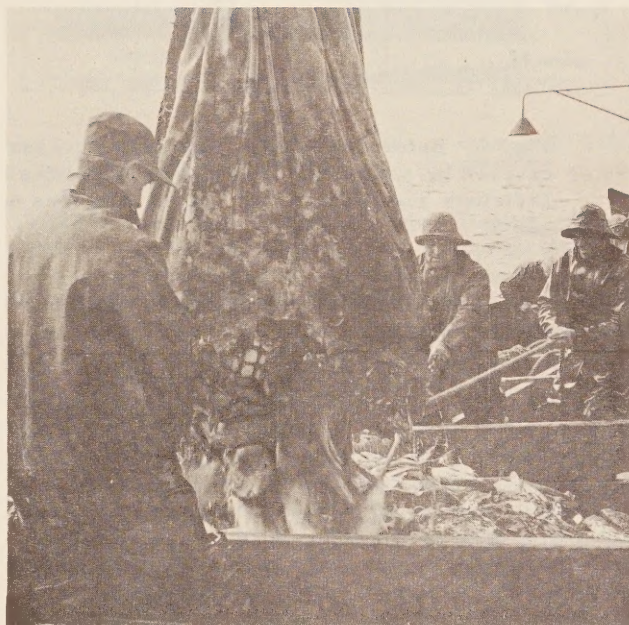
Finally, a quick look at the composition of research-vessel survey catches helps us to recognize species and areas which offer potentials for increased commercial catches.

A reference map is shown in Fig 1.

LANDINGS

Total landings have steadily increased during the past 45 years. Abnormal peaks were observed at the end of each war, and landings were abnormally low during the depression '30's (see Fig 2).

The increasing demand for fish has been met by increasing effort on the groundfish, pelagic fish, and mollusc groups. Fishermen have increased groundfish landings by adopting net dragging methods capable of taking smaller sizes of those species



North Atlantic fishermen empty the cod end of a net on the deck of a trawler.

already exploited (e.g., cod and haddock). Draggers also take small-mouthed species (e.g., flounders and redfish) which could not be caught efficiently with traditional hook-and-line gear. During the early development of otter trawling, many small fish and unmarketable species were discarded at sea. However, with development of markets and use of large-mesh nets, wastage of fish at sea has been reduced, and total landings have proportionally increased. Pelagic species are underfished, and landings of herring and swordfish have been increasing with growing market demand. No long-term increase is apparent in the landings of heavily-fished species such as lobsters and estuarial fish, including salmon. Some of the inshore mollusc species such as clams and oysters also appear to be fully used, and landings have declined in recent years. However,



Fig. 1. Reference map. Approximate area covered by winter ice is shaded. Statistical Divisions are shown for ICNAF Subareas 4 and 5.

increased fishing for offshore scallops has increased total mollusc landings.

Commercial landings of all species in the Maritime Provinces and Quebec now amount to about 60 per cent of Canadian Atlantic landings, or about 20 per cent of total landings for all countries from the entire Northwest Atlantic (ICNAF) area. The groundfish landings of this Canadian mainland region are comparable in weight with those of Newfoundland. Landings of the other major species groups (pelagic fish and shellfish) are very much larger in the Maritimes and Quebec than in Newfoundland. Groundfish landings account for about 60 per cent of total Canadian mainland landings, but about 90 per cent of total Newfoundland landings. The other 40 per cent of Maritime and Quebec landings is currently divided to about 24 per cent pelagic fish (mainly herring), 11 per cent molluscs (mainly scallops), and 5 per cent crustaceans (lobsters).

VALUES OF PRODUCTS

The Canadian fishing industry is directly concerned of course with dollars returned from its operations, rather than with the weight of landings. Accordingly, the values of products are examined (see Fig 3).

Total product values have increased more rapidly than the weight of landings, with the increases being particularly rapid since the beginning of World War II. The values of products at the

plants have increased rapidly for several reasons, the most important of which is the general rise in price levels. Other important reasons are development of new products and improved quality, and increased demand for certain species with relatively fixed supply, such as lobster, oyster, salmon, halibut and swordfish.

The growth in relative importance of the mobile or offshore fleet has been an important factor affecting both landings and value of products. Before World War II most species were taken by inshore fishermen. The only important exceptions were cod, haddock, and halibut, which were taken by offshore dory schooners as well as by inshore gears. We now find that 60 per cent of the groundfish landings are taken with towed nets, mainly otter trawls. Over half the remaining groundfish landings are taken by longliners, fishing in offshore waters. The mobile fleet is also becoming increasingly important in landing pelagic fish. Swordfish are caught offshore with harpoons and longlines; tuna are being sought offshore and purse seiners are taking an important share of the sardine-herring catch. An increase in mollusc landings has resulted from offshore scallop dragging on Georges Bank. In summary, about half the product value for the Maritimes and Quebec now results from landings by the mobile fleet.

PROVINCES

Landings and product values are presented by individual provinces in Figs. 4 and 5.

The trends apparent in the combined charts can also be seen in the provincial charts. Landings are increasing through development of varied fishing

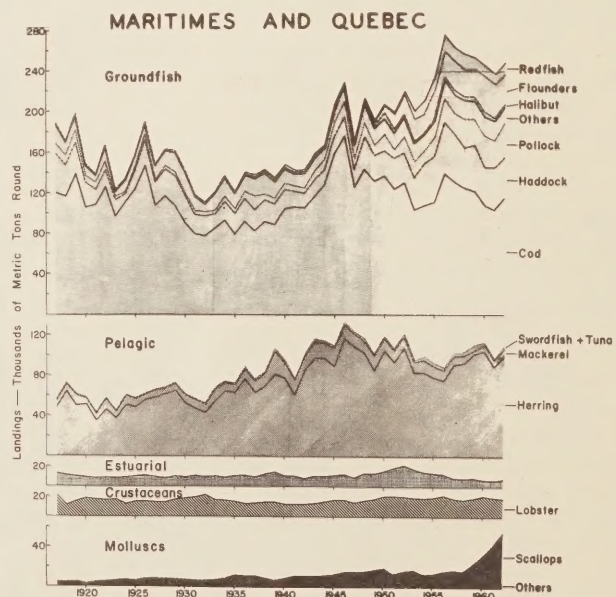


Fig. 2. Landings of commercial fisheries, 1917-1962.

gears, which catch a greater variety of sizes and species of fish from offshore as well as inshore fishing grounds.

Fishing ports on ice-free coastlines are developing most rapidly. Nova Scotia and southern New Brunswick have the advantage of winter ports, permitting continuity of supplies for year-round operations. Ports in Quebec, Prince Edward Island, and on the east coast of New Brunswick are at a competitive disadvantage because they are ice-bound for several winter months each year. Nova Scotia and southern New Brunswick also have the advantage of best access to the greater variety of fast-growing, marketable species found in the southern waters of the area. Haddock, pollock, wolffish, halibut, yellowtail flounders, swordfish, tuna, sardine herring, and scallops are all more abundant on southern grounds (Nova Scotia, Bay of Fundy, and New England) than in the Gulf of St. Lawrence. The combination of open ports and better access to a greater variety of fast-growing species has led to the development of a greater size range and greater variety of fishing vessels at Nova Scotia and southern New Brunswick ports. Large otter trawlers, Danish seiners, offshore longliners, purse seiners, and powerful scallop draggers have been built to go after fish on a year-round basis. Inshore boats can only fish seasonally. The mobile fleet is continuing to expand at a fairly rapid rate.

The development of a more efficient, mechanized, mobile fleet has not only increased the quantity and variety of species landed, but it has improved the continuity of supplies for processing and marketing. At the same time, it has increased the earnings of fishermen employed on these boats. The manpower used to catch a given weight of fish has been significantly reduced in spite of the greater scarcity of the larger sizes of some kinds.

The large number of small fishing communities of pre-war years is giving way to a smaller number of larger communities based on offshore operations. This centralization of fishing operations has important economic and social consequences for fishermen and their families. Improved earnings raise the standard of living and the increased prosperity of communities leads to better educational welfare and other social services. Those dependent on the handling and processing of fish ashore benefit as well. They enjoy fuller employment throughout the year and share in the community development. The centralization of shore operations in the fishing industry may be seen throughout the Maritime Provinces and Quebec. However, it is most apparent on the south shores of Nova Scotia and New Brunswick where there is a competitive advantage resulting from year-round operations for a greater variety of fast-growing species.

FOREIGN COMPETITION

Statistical Bulletins of the International Commission for the Northwest Atlantic Fisheries

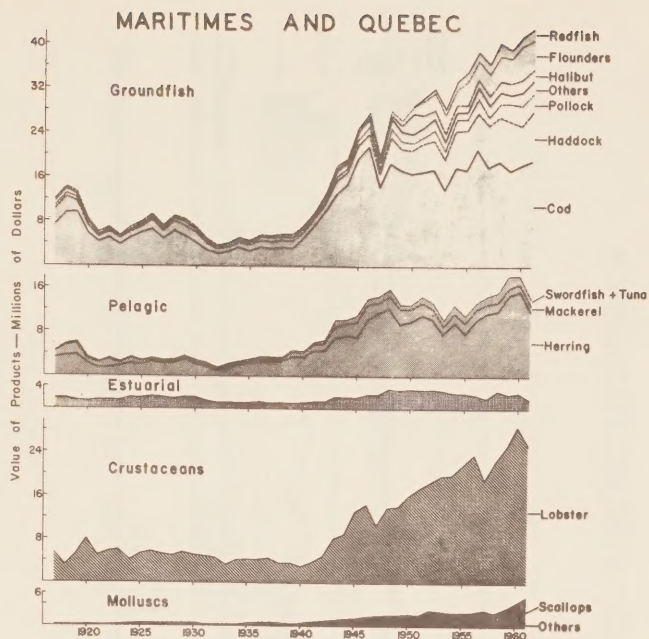


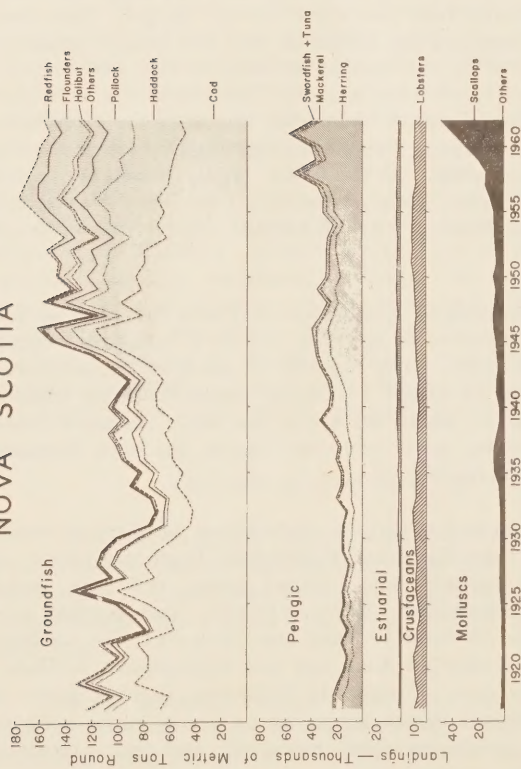
Fig. 3. Product values of commercial fisheries, 1917-1961.

(ICNAF) show that international fishing has increased rapidly throughout the Northwest Atlantic area since World War II. At least six countries now have important fisheries in ICNAF Subarea 4. The expanding international fishery is indicative of healthy resources. In Subarea 4 total landings and species variety are still smaller, and catch per unit of effort and fish sizes are still larger, than they are in comparable areas of the Northeast Atlantic Ocean. With increasing demand for marine resources, Northwest Atlantic fisheries trends are following the same course as those of the Northeast Atlantic Ocean. Total landings and species variety are increasing. At the same time, availability and sizes of some species are decreasing, as more intensive fishing reduces the abundance of large fish.

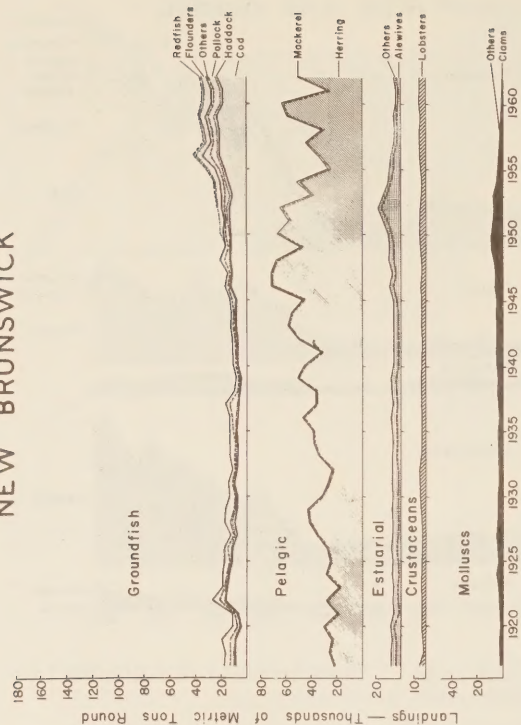
The ICNAF Statistical Bulletin for 1960 shows that the number of species landed increases from north to south. The number of species landed commercially is about 35 from Newfoundland waters (Subarea 3), about 45 from the Maritimes area (Subarea 4), and over 60 from the New England area (Subarea 5).

United States fishermen land many more species than Canadian fishermen from waters of common interest. Silver hake, red hake, sand lance, menhaden, butterfish, and dogfish are examples of species that are important to New England fisheries but not yet significant in Canadian landings. Canada is following in the wake of United States development by taking more species through mechanization, mobility, and centralization of fishing operations.

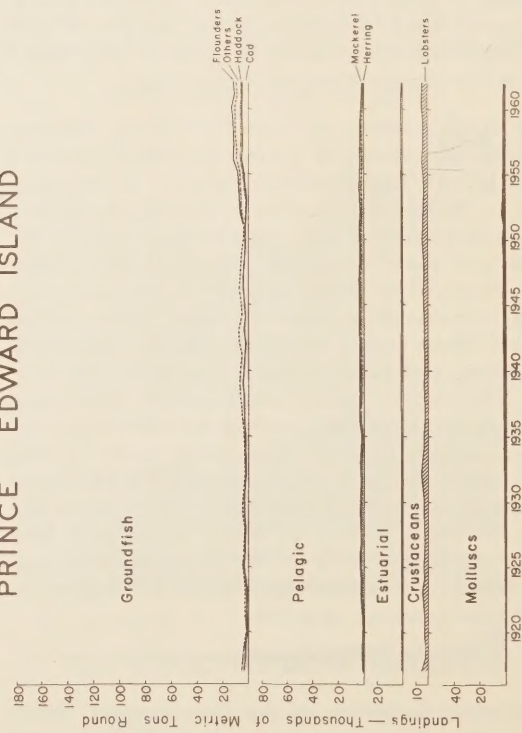
NOVA SCOTIA



NEW BRUNSWICK



PRINCE EDWARD ISLAND



QUEBEC

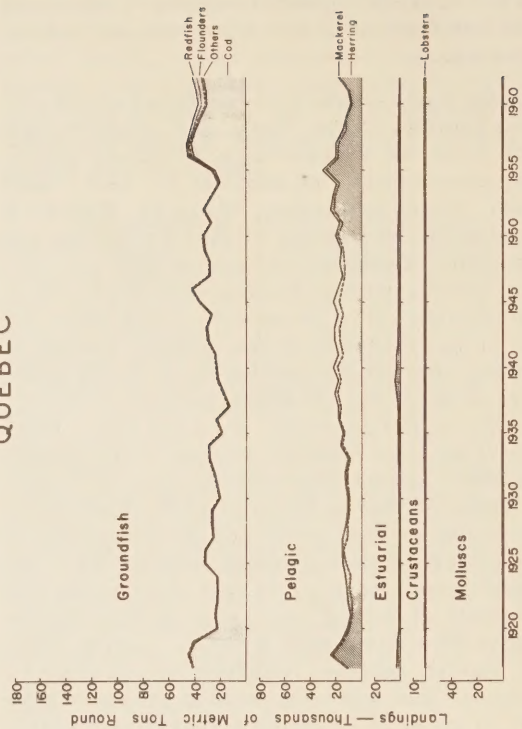
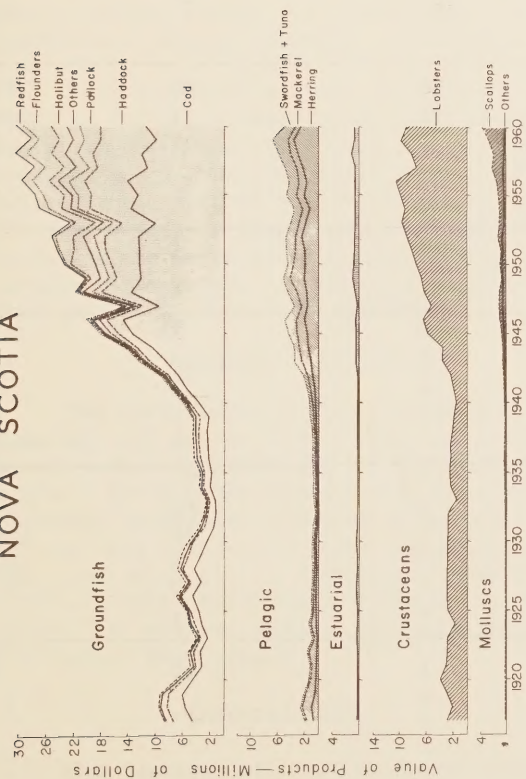
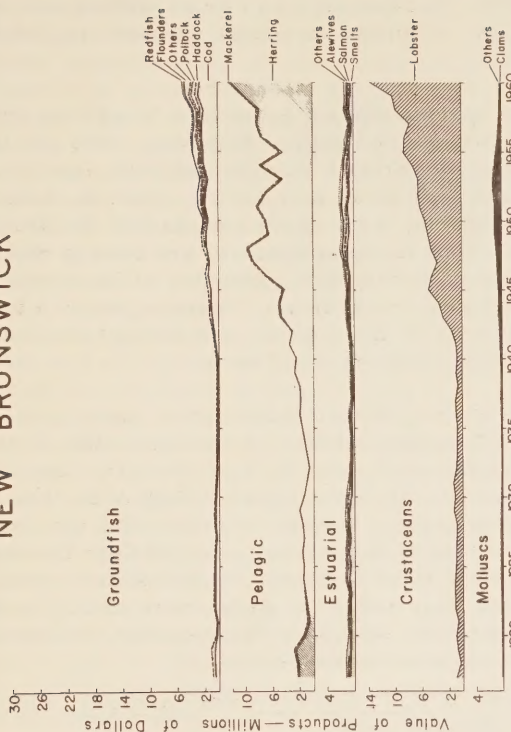


Fig. 4. Landings of commercial fisheries, Maritimes and Quebec, by Provinces, 1917-1962.

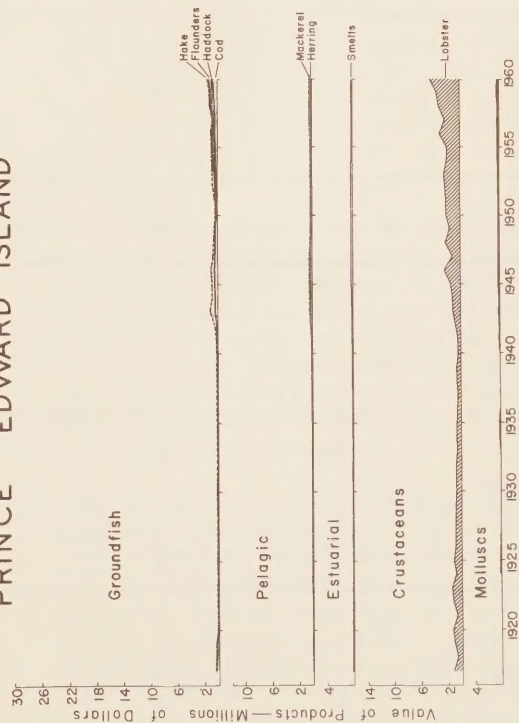
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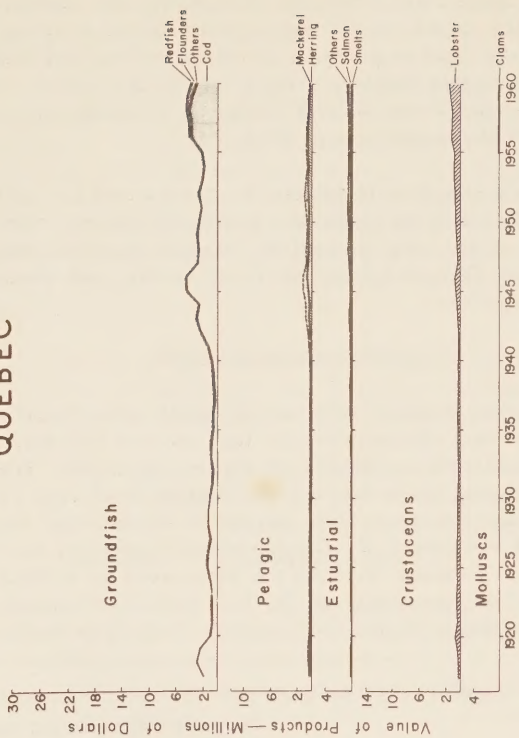


Fig. 5. Values of products, commercial fisheries, Maritimes and Quebec, by Provinces, 1917-1960.

A large fleet from the U.S.S.R. has demonstrated the potential for exploitation of herring, silver hake, and argentines on offshore New England and Nova Scotia Banks. The U. S. S. R. catch of these species from ICNAF Subarea 5 increased to about 200 thousand tons in 1962.

New longline fisheries by Norwegian and United States fishermen for mackerel shark (porbeagle), tunas, and swordfish suggest possibilities for larger Canadian longline fisheries for these pelagic species.

OFFSHORE SURVEYS

Survey cruises with small-mesh otter trawls have provided information on the species and sizes of fish available on Subarea 4 fishing grounds. The accompanying table shows the numbers of fish by species per thousand fish caught in cruises by the research vessels A. T. Cameron and Harengus during 1960. Cruises have been separated by ICNAF Division, western Gulf of St. Lawrence (4T), eastern Nova Scotia Banks (4V), and central Nova Scotia

Banks (4W). Because of seasonal differences in distribution, summer and winter catches are listed separately.

The species which grow to a large size are all used commercially. However, little use is made of the abundant dogfish and skate species. Other round fish (cod, haddock, redfish, hake, pollock, wolffish, and cusk) and flatfish (halibut, turbot, and four flounder species) are used at marketable sizes. Substantial quantities of most kinds are still discarded at sea, because they are too small, in spite of the general use (except for redfish) of large-mesh ($4\frac{1}{2}$ -inch) nets.

One of the greatest undeveloped opportunities for larger Canadian catches is on either side of the Laurentian Channel, near Cabot Strait, during winter months. At this season, Gulf of St. Lawrence cod migrate to depths of about 100 fathoms and concentrate in the general areas of Cape Breton and southwest Newfoundland. Winter survey hauls in this area have taken large catches of cod, and the fish have been seen on echo sounders in dense

Table I. Numbers by species per 1000 fish caught in survey cruises of A. T. Cameron and Harengus, winter (January-March) and summer (May-October), 1960.

	4T		4V		4W	
	Summer	Winter	Summer	Winter	Summer	Winter
Cod	497	448	362	350	48	40
Haddock	23	20	155	110	513	475
Redfish	76	182	308	367	77	41
Halibut	-	-	-	-	1	1
Plaice	272	64	108	50	59	67
Witch	5	8	9	43	1	8
Yellowtail	15	2	22	1	92	9
Winter Flounder	5	-	-	-	-	-
Turbot	-	1	-	-	-	-
Skates	5	35	12	22	5	7
Dogfishes	-	54	-	16	-	-
Hake	9	57	2	25	8	27
Pollock	1	1	4	1	3	11
Wolffish	-	-	-	2	1	1
Cusk	-	-	-	-	-	1
Monkfish	-	-	1	-	2	2
Mackerel	-	-	-	-	-	1
Herring	77	46	2	2	82	85
Silver Hake	-	9	4	-	76	115
Argentine	-	-	-	-	3	102
Capelin	-	2	-	-	7	-
Smelt	-	3	-	-	1	-
Sculpin	7	4	5	1	20	7
Eelpout	4	2	3	4	-	1
Grenadiers	2	53	-	-	-	-
Rockling	-	2	-	-	-	-
Stickleback	-	3	-	-	-	-
Other	2	4	3	6	1	1

concentrations. Large trawlers from France, Portugal, Spain, and Denmark (Faroes) exploit these concentrations of cod during the months of January to April. Surface ice and deck icing frequently interfere with fishing operations. However, the trawlers generally manage to carry out profitable operations somewhere in the Cabot Strait area. Canadian fishermen carry out some winter line fishing in this area, but almost no otter trawling. Much greater catches can be taken by Canadian otter trawlers from these winter concentrations of cod. During spring to fall months weather and sea conditions are better for fishing, but at these seasons cod are spread out over larger areas, and are much less available to otter trawlers.

Another group of species is abundant on trawling grounds, but the sizes are so small that most escape through the large meshes which are in general use in towed nets. Large catches of herring, silver hake, and argentine can be taken by otter trawls if satisfactory markets are developed for them. Large catches of capelin and sand lance have been taken on other survey cruises. Both of these species offer possibilities for higher landings of fish from offshore Nova Scotia Banks. Small-mesh otter trawls will be required to exploit these small species.

A final group of small fishes (sculpins, eelpouts, grenadiers, rockling, and others) is available in large quantities on fishing grounds. Most of these species are released by 4- 1/2-inch-mesh otter trawls. Since these species are not being used by other countries fishing the ICNAF area, early utilization by Canadian fishermen is not anticipated.

Less extensive surveys are showing the possibilities for development of offshore pelagic fisheries. Herring have been found to be abundant and available to otter trawls, drift nets, and purse seines, when markets warrant offshore fishing. The distribution of larger pelagic species is being studied to provide advice to industry and government on ways of developing or expanding fisheries for tuna, porbeagle shark, and swordfish.

INSHORE POTENTIAL

The possibilities for development of inshore fisheries will not be discussed in any detail here. It will suffice to point out that several species--mussels, periwinkles, spider crabs, prawn shrimps, seaweeds, lampreys, flounders, billfish, mackerel, herring, and others--are either unexploited or not fully used by inshore fishermen. Other species which are fully exploited and of high value, lobster, oyster, and salmon, might be increased through fish-culture development.

FORECASTS

Our examination of past trends in Canadian Atlantic mainland fisheries, and of foreign fishing

and fish surveys in the same general area, provides background for forecasting fisheries trends.

With increasing North American and world human populations more fish will be needed to meet demand. Thus, Canadian and international fish landings from the southern part of the ICNAF area can be expected to increase. New technology and new techniques will be introduced to fishing operations in attempts to maintain high values of products and satisfactory returns to industry. The following trends are expected:

- (1) The number of species landed will increase. Some of these will be tunas, skates, silver hake (whiting), argentines, and mussels.
- (2) There will be greater utilization of small fish now discarded at sea. Discards of flounders, and sometimes cod and haddock, will be reduced as markets develop for small fish.
- (3) We will see increased exploitation of stocks, particularly offshore, but also inshore. Although some inshore resources still offer possibilities for increased exploitation, the major developments are expected to be on underdeveloped offshore resources such as herring.
- (4) More intensive fishing by international fleets will reduce abundance and sizes of exploited species. The abundance of larger animals can be expected to decrease, on the average. Fluctuations will continue to result from variations in year-class strength and distribution. Fish sizes will continue to decrease because of a gradual lowering of cull sizes for landing and because of the reduced numbers of large fish resulting from heavier fishing. The increasing use of otter trawlers contributes to reduced abundance and smaller sizes of fish, as well as to increased quantities and variety in landings.
- (5) There will be greater use of improved fishing gear, equipment, and vessels. Small-mesh otter trawls will be required to catch some of the small species as they are needed. More efficient towed nets, mechanized gear and fish handling at sea, improved fish-detection equipment, larger stern trawlers, offshore long-liner-Danish seiners, and different types of purse seiner, are expected.
- (6) There will be greater application of accumulating knowledge of bottom topography, hydrographic barriers, fish distribution and concentrations. Extension work among fishermen is necessary to take advantage of the knowledge already available and rapidly accumulating. For example, Canadian otter-trawl exploitation of the known winter deep-water concentrations of Gulf of St. Lawrence cod would be a sensible development.

- (7) Increased mobility and variety in fishing operations will provide stability and diversity in year-round production. The growing mobile fleet can be expected to take an ever-increasing share of total production.
- (8) Centralization of offshore fishing operations in a smaller number of larger, shore-based plants will continue. This is under way in all Atlantic Provinces.
- (9) Advantages for operations on southern, open-water coasts will result in faster development there. Although the fisheries of all Atlantic Provinces are expanding, development programs are giving greater returns on the south coasts of Nova Scotia, New Brunswick, and Newfoundland.
- (10) New products, improved quality, wider markets, and more efficient handling and processing methods will be developed. Programs of research and development in these fields are helping Canadian producers to compete for markets, and, in some cases, to increase per capita consumption.
- (11) Increased marketing of the live animals of certain species will result from research and intelligence. Costs of mortalities and handling of lobsters will continue to be reduced, and the experience should lead to marketing of live fish of other species such as flounders.
- (12) Attempts will be made to increase inshore stocks through manipulation of species and environment, especially for valuable kinds. Although costs of these types of management are high, they should be explored wherever possibilities for over-all profits can be foreseen. Oysters, lobsters, and salmon are receiving current attention.
- (13) Interest will increase in management of fisheries to obtain and to maintain optimum yields as related to market requirements and economical use of manpower and capital. It is increasingly apparent that protective regulations controlling sizes of animals caught and landed, such as mesh regulations, should be extended to measures for control of total fishing effort, if waste of human effort and of capital is to be avoided. In regulating fisheries, both total costs and value of products must be considered in determining optimum levels of exploitation.

In summary then, increased human population will lead to increased demand for fish, and to meet these requirements increased landings from the southern part of the ICNAF area are expected. Wise use of the resources will require development programs and international management to avoid waste. An active program of Canadian research, development, inspection, and education will be needed to assist with maintenance of Canada's competitive position in exploitation of available marine resources. ✓